

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF RECEIPT OF
RECORD COPY

(PCT Rule 24.2(a))

From the INTERNATIONAL BUREAU

To:

SUMIDA, Yoshihiro
3rd Fl., Bo-eki Bldg.
123-1, Higashi-machi
Chuo-ku
Kobe-shi, Hyogo 650-0031
Japan



Date of mailing (day/month/year) 22 January 2003 (22.01.03)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 02P379WO/ KRE	International application No. PCT/JP02/12951

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. (for all designated States except US)
SAITO, Toru et al (for US).

International filing date : 11 December 2002 (11.12.02)

Priority date(s) claimed : 11 December 2001 (11.12.01)

Date of receipt of the record copy
by the International Bureau : 10 January 2003 (10.01.03)

List of designated Offices :

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW

EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

EP : AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR

OA : BF, BJ, CF, CG, CI, CM, GA, GN, GO, GW, ML, MR, NE, SN, TD, TG

National : AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ,
EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,
LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase - see updated important information (as of April 2002)
- ☐ confirmation of precautionary designations (if applicable)
- ☐ requirements regarding priority documents (if applicable)

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 338.70.10

Authorized officer:

Rémy CALCAGNO (Fax 338 7010)

Telephone No. (41-22) 338 9018

INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated on the cover sheet of this Notification by paying national fees and furnishing translations, as prescribed by Articles 22 and 39 and the applicable national laws. In addition, the applicant may also have to comply with other special requirements applicable in certain Offices. It is the applicant's responsibility to ensure the necessary steps to enter the national phase are taken in a timely fashion. Most Offices do not issue reminders to applicants in connection with the entry into the national phase.

The applicable time limit for entering the national phase will, subject to what is said in the following paragraph, be **30 MONTHS** from the priority date, not only in respect of any elected Office where a demand for international preliminary examination is filed before the expiration of 19 months from the priority date (see Article 39(1)), but also in respect of any designated Office, in the absence of filing of such demand, where Article 22(1) as modified with effect from 1 April 2002 applies in respect of that designated Office. For further details, see PCT Gazette No. 44/2001 of 1 November 2001, pages 19926, 19932 and 19934, as well as the PCT Newsletter, October and November 2001 and February 2002 issues.

In practice, time limits other than the 30-month time limit will continue to apply, for various periods of time, in respect of certain designated or elected Offices. For regular updates on the applicable time limits (20, 21, 30 or 31 months, or other time limit), Office by Office, refer to the PCT Gazette ("Section IV" part published on a weekly basis), to the PCT Newsletter (on a monthly basis) and to the relevant National Chapters in Volume II of the PCT Applicant's Guide (the paper version of which is updated usually twice a year and the Internet version of which is updated usually on a weekly basis). Finally, a cumulative table of all applicable time limits for entering the national phase is available from WIPO's Internet site, via links from various pages the site including those of the Gazette, Newsletter and Guide, at <http://www.wipo.int/pct/en/index.html>.

Information about the requirements for filing a demand for international preliminary examination is set out in the PCT Applicant's Guide, Volume I/A, Chapter IX. Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date (this time limit may not be extended). If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. The Notice of confirmation and payment must reach the receiving Office within the 15-month time limit.

REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within the time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

PATENT COOPERATION TREATY

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NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

SUMIDA, Yoshihiro
3rd Fl., Bo-eki Bldg.
123-1, Higashi-machi
Chuo-ku
Kobe-shi, Hyogo 650-0031
Japan



Date of mailing (day/month/year) 26 March 2003 (26.03.03)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 02P379WO / KRE	
International application No. PCT/JP02/12951	International filing date (day/month/year) 11 December 2002 (11.12.02)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 11 December 2001 (11.12.01)
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
11 Dece 2001 (11.12.01)	2001-377112	JP	07 Marc 2003 (07.03.03)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 338.70.10

Authorized officer

Eric SANSON (Fax 338 7010)

Telephone No. (41-22) 338 9999

From the INTERNATIONAL BUREAU

PCTNOTICE INFORMING THE APPLICANT OF THE
COMMUNICATION OF THE INTERNATIONAL
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

SUMIDA, Yoshihiro
3rd Fl., Bo-eki Bldg.
123-1, Higashi-machi
Chuo-ku
Kobe-shi, Hyogo 650-0031
JAPONDate of mailing(day/month/year)
19 June 2003 (19.06.03)Applicant's or agent's file reference
02P379WO**IMPORTANT NOTICE**International application No.
PCT/JP02/12951International filing date(day/month/year)
11 December 2002 (11.12.02)Priority date(day/month/year)
11 December 2001 (11.12.01)

Applicant

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

1. Notice is hereby given that the International Bureau has **communicated**, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this notice:

CH, EP, KP, KR, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE, AG, AL, AM, AP, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EA, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OA, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this notice is a copy of the international application as published by the International Bureau on 19 June 2003 (19.06.03) under No. 03/050880

4. **TIME LIMITS for filing a demand for international preliminary examination and for entry into the national phase**

The applicable time limit for entering the national phase will, **subject to what is said in the following paragraph**, be **30 MONTHS** from the priority date, not only in respect of any elected Office if a demand for international preliminary examination is filed before the expiration of **19 months** from the priority date, but also in respect of any designated Office, in the absence of filing of such demand, where Article 22(1) as modified with effect from 1 April 2002 applies in respect of that designated Office. For further details, see *PCT Gazette* No. 44/2001 of 1 November 2001, pages 19926, 19932 and 19934, as well as the *PCT Newsletter*, October and November 2001 and February 2002 issues.

In practice, **time limits other than the 30-month time limit** will continue to apply, for various periods of time, in respect of certain designated or elected Offices. For **regular updates on the applicable time limits** (20, 21, 30 or 31 months, or other time limit), Office by Office, refer to the *PCT Gazette*, the *PCT Newsletter* and the *PCT Applicant's Guide*, Volume II, National Chapters, all available from WIPO's Internet site, at <http://www.wipo.int/pct/en/index.html>.

For filing a demand for international preliminary examination, see the *PCT Applicant's Guide*, Volume I/A, Chapter IX. Only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

It is the applicant's **sole responsibility** to monitor all these time limits.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Judith Zahra

Facsimile No.(41-22) 740.14.35

Telephone No.(41-22) 338.91.11

PATENT COOPERATION TREATY

PCT

COMMUNICATION IN CASES FOR WHICH
NO OTHER FORM IS APPLICABLE

From the INTERNATIONAL BUREAU

To:

MATSUSHITA ELECTRIC INDUSTRIAL
CO., LTD.
1006, Oaza Kadoma,
Kadoma-shi, Osaka 571-8501
JAPAN

P-9699 有古

Date of mailing (day/month/year) 22 January 2003 (22.01.03)	
Applicant's or agent's file reference 02P379WO	REPLY DUE see paragraph 1 below
International application No. PCT/JP02/12951	International filing date (day/month/year) 11 December 2002 (11.12.02)
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.	

1. ☐ REPLY DUE within _____ months/days from the above date of mailing
- ☐ NO REPLY DUE, however, see below
- ☒ IMPORTANT COMMUNICATION
- ☐ INFORMATION ONLY

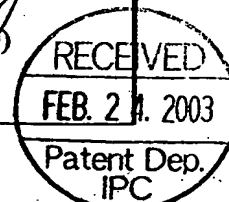
2. COMMUNICATION:

MATTERS RELATING TO THE DESIGNATION OF SLOVENIA

The applicant is hereby informed that Slovenia (SI) is bound by the European Patent Convention (EPC) since 01 December 2002. Moreover, it is no longer possible in an international application to designate Slovenia for a national patent. Therefore, in international applications filed on or after 01 December 2002, Slovenia may be designated only for a European patent and not for a national patent.

Since, in respect of the above-mentioned international application, Slovenia is designated both for a European patent and a national patent, the purported designation for a national patent has been deleted *ex officio* by the International Bureau.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Rémy CALCAGNO (Fax 338 7010)
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/12951

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl⁷ H01L29/737, H01L21/331

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl⁷ H01L29/68-29/737, H01L21/33-H01L21/331, H01L21/203,
H01L21/205

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Toroku Jitsuyo Shinan Koho	1994-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Jitsuyo Shinan Toroku Koho	1996-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6255674 B1 (DAIMLERCHERYSLER AG), 03 July, 2001 (03.07.01), Full text; Figs. 1 to 4	1-3, 5-8
Y	Full text; Figs. 1 to 4 & EP 969515 A2 & DE 19824110 A1	4
Y	EP 1065728 A2 (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.), 03 January, 2001 (03.01.01), Full text; Figs. 1 to 22 & JP 2001-68479 A Full text; Figs. 1 to 22 & US 2002/0158313 A1	4

☒ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
10 March, 2003 (10.03.03)

Date of mailing of the international search report
25 March, 2003 (25.03.03)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/12951

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2001-326230 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.), 22 November, 2001 (22.11.01), Full text; Figs. 1 to 14 & EP 1209749 A1 & KR 2039319 A & US 2002/0158311 A1 & WO 01/88994 A1	1-8
A	JP 2000-68283 A (Hitachi, Ltd.), 03 March, 2000 (03.03.00), Full text; Figs. 1 to 23 & US 2002/0024061 A1 & US 6388307 B1	1-8
E,X	JP 2002-270817 A (NEC Corp.), 20 September, 2002 (20.09.02), Full text; Figs. 1 to 15 & WO 02/75814 A1	1-8

(19) 世界知的所有権機関
国際事務局



(43) 国際公開日
2003 年 6 月 19 日 (19.06.2003)

PCT

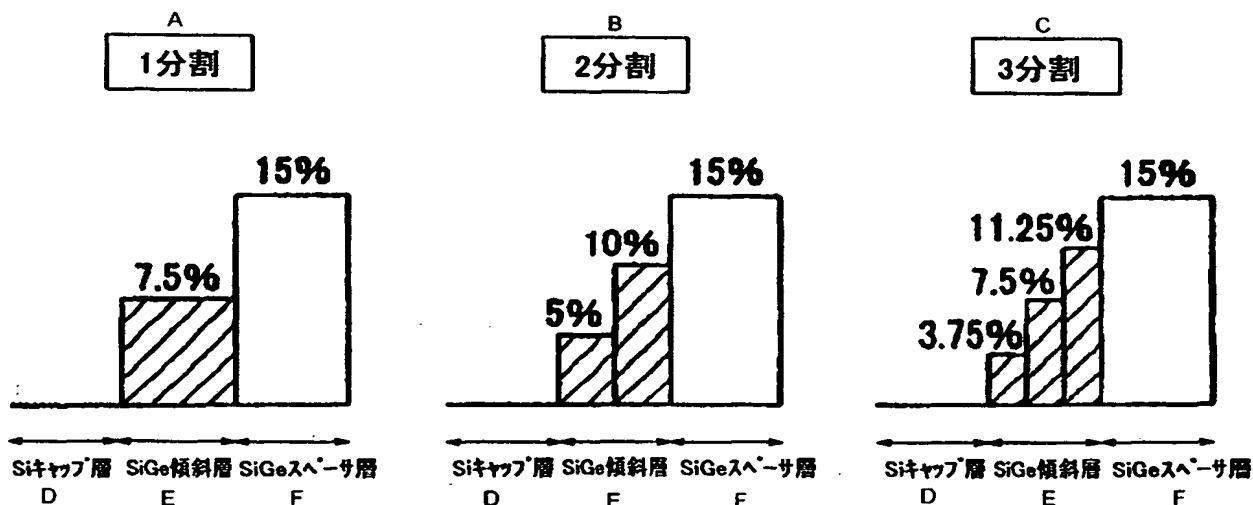
(10) 国際公開番号
WO 03/050880 A1

- (51) 国際特許分類: H01L 29/737, 21/331 (72) 発明者; および
(75) 発明者/出願人 (米国についてのみ): 齋藤 徹
(SAITOH, Toru) [JP/JP]; 〒567-0832 大阪府 茨木市
白川 2-4-10 Osaka (JP). 青木 成剛 (AOKI, Shigetaka)
(21) 国際出願番号: PCT/JP02/12951 [JP/JP]; 〒582-0001 大阪府 柏原市 本郷 1-1-12 Os-
aka (JP). 能澤 克弥 (NOZAWA, Katsuya) [JP/JP]; 〒
(22) 国際出願日: 2002 年 12 月 11 日 (11.12.2002) 535-0002 大阪府 大阪市 旭区 大宮 5-4-25-1101 Os-
aka (JP). 大西 照人 (OHNISHI, Teruhito) [JP/JP]; 〒
(25) 国際出願の言語: 日本語 573-0049 大阪府 枚方市 山之上北町 60-1-1202 Osaka
(26) 国際公開の言語: 日本語 (JP).
(30) 優先権データ: (74) 代理人: 角田 嘉宏, 外 (SUMIDA, Yoshihiro et al.); 〒
特願 2001-377112 650-0031 兵庫県 神戸市 中央区 東町 123 番地の 1 貿易
ビル 3 階 Hyogo (JP).
2001 年 12 月 11 日 (11.12.2001) JP
(71) 出願人 (米国を除く全ての指定国について): 松下電
器産業株式会社 (MATSUSHITA ELECTRIC INDUS-
TRIAL CO., LTD.) [JP/JP]; 〒571-8501 大阪府 門真市
大字門真 1006 番地 Osaka (JP).
(81) 指定国 (国内): AE, AG, AL, AM, AT, AU, AZ, BA, BB,
BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK,
DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,
ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS,

[続葉有]

(54) Title: HETEROBIPOLAR TRANSISTOR

(54) 発明の名称: ヘテロバイポーラトランジスタ



A...ONE SPLIT
B...SPLIT INTO TWO
C...SPLIT INTO THREE

D...Si CAP LAYER
E...SiGe GRADED LAYER
F...SiGe SPACER LAYER

(57) Abstract: In a heterobipolar transistor, an SiGe spacer layer (40), an SiGe graded layer (41) partly functioning as a base layer and composed of split layers of different Ge contents, and an Si cap layer (42) are formed on a collector layer (12) formed in a portion of an Si substrate (10). In the SiGe graded layer (41), as the thickness of each split layer increases, as the number of split layers decreases, and as the difference of the Ge composition between adjoining split layers increases, the measurement of the film thickness becomes easier. To avoid degradation of the device cutoff frequency, it is necessary that the thickness of each split layer is about 20 nm or less, and it is preferable that the number of split layers is two or greater.

[続葉有]



LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

許 (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:

国際調査報告書

(84) 指定国 (広域): ARIPO 特許 (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア特許 (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ特許 (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI 特

2 文字コード及び他の略語については、定期発行される各 PCT ガゼットの巻頭に掲載されている「コードと略語のガイダンスノート」を参照。

(57) 要約:

本発明のヘテロバイポーラトランジスタにおいて、Si 基板 (10) の一部に形成されたコレクタ層 (12) の上には、SiGe スペーサ層 (40) と、一部がベース層として機能し、Ge 組成比の異なる複数の分割層からなる SiGe 傾斜層 (41) と、Si キャップ層 (42) とが形成されている。SiGe 傾斜層 (41) においては、各分割層の膜厚は厚く、分割層の数は少なく、隣接する分割層間の Ge 組成比の変化が大きい方が膜厚の測定は容易となる。ただし、デバイスの遮断周波数特性などの劣化を回避するため、各分割層の膜厚は 20 nm 程度以下であることが必要であり、分割層の数は 2 以上であることが好ましい。